

REMARKS

Claims 16-25 stand rejected. Claims 16-25 are pending in this application. In view of the following remarks, it is submitted that all of the presently pending claims are allowable, and reconsideration is respectfully requested.

To facilitate matters in this paper, first the Examiner's comments, then the Applicants' previous remarks, and finally the Examiner's response will be briefly summarized, after which a detailed discussion will be provided. For the sake of brevity, the discussion will focus on the subject matter of Claim 16, and the remaining claims will be addressed at the end of these Remarks.

1. Rejection of Claim 16 (35 U.S.C. § 103(a))

In the Office Action mailed on February 25, 2004, Claim 16 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nally et al. (U.S. Patent No. 5,544,816) in view of Rhoades (U.S. Patent No. 4,995,949).

Nally et al. generally describe a fuel injector for use in an internal combustion engine. The fuel injector includes a fuel inlet opening 56, a movable needle valve 24, and a valve seat member 40. The fuel injector has a downstream valve end including an orifice member 41 and a fuel outlet (not explicitly disclosed). All these elements make up a fuel injector as used in internal combustion engines. As admitted by the Examiner, Nally et al. do not teach or suggest a coating.

Rhoades's disclosure deserves closer inspection. Rhoades generally describes a method for forming orifices providing a constant, predetermined rate of flow of a fluid. Such fluid could be, for example, engine fuel. The way the flow resistance is controlled is by controlling the orifice geometry (e.g., length and diameter). However, a precise control of the geometry to the tolerance required in some applications is very difficult, if not impossible, with conventional fabrication techniques (col.1, lines 14-19). The method of Rhoades starts instead with an orifice that is substantially oversized or undersized (col.10, lines 46-53). For an oversized orifice, electroplating and similar processes are used to *reduce* the diameter. For an undersized orifice, chemical

machining and similar processes are used to *increase* the diameter. The processing fluid is caused to flow through the orifice while the flow resistance is being monitored.

The process is stopped when a target flow resistance has been reached (claim 1).

Rhoades mentions that PTFE (a fluorine-containing coating material) may be used to add lubricating properties to the surface (col.8, lines 5-6).

On the basis of the two disclosures of Nally et al. and of Rhoades, the Examiner alleged: "It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the device of Nally et al. by providing a coating comprising PTFE around the at least one discharge orifice as taught by Rhoades in order to attain precise flow resistance." Before addressing the merits of the Examiner's allegation, Applicants' previous remarks will be summarized in the next section.

2. Applicants' previous amendments and remarks

In the Amendment mailed on May 25, 2004, Applicants amended Claim 16, which now recites a fuel injector having "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice." Applicants further noted that neither Nally et al. nor Rhoades taught or suggested this limitation. As discussed in the Amendment, Rhodes specifically notes that "electrochemical, chemical and electrical discharge machining are widely employed . . . for machining and finishing operations on **internal shapes**, bores, apertures, complex three dimensional shapes, and other difficult operations." (Col. 4, lines 44-49). Additionally, Rhoades states that "[f]or electroplating, electroless plating and vapor deposition in applications apropos to the present invention, the workpiece must be held in an apparatus such that **the processing fluid flow is confined to passage through the orifice(s) to be plated or coated and sized.**" As can be seen from above discussions, Rhoades relates to methods of finishing the *inner surface* of orifices, and Rhoades simply does not teach or suggest coating of an immediate exterior of an outlet area of the orifice, as recited in claim 16.

Since the combination of Nally et al. and Rhoades fails to teach or suggest all the limitations of Claim 16, this claim was submitted to be allowable. Analogous amendments and remarks were made with respect to Claims 21 and 22. Remarks made with respect to other claims will be addressed in Section 5 below.

3. Examiner's response

In the Office Action mailed on September 10, 2004, the Examiner replied that Applicants' arguments were not considered to be persuasive. In relation to Rhoades's disclosure, the Examiner observes that "in finishing the entire inner surface of an orifice, the coating will extend to the edge radius of the outlet of the orifice in which the edge radius of the outlet of the orifice can be considered to be an immediate exterior of an outlet area of the at least one discharge orifice."

4. Discussion

To establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), the prior art references must teach or suggest all the claim limitations. M.P.E.P. § 2143.03. Applicants submit that the combination of Nally et al. and Rhoades does not teach or suggest "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice." By asserting that "the coating will extend to the edge radius of the outlet of the orifice," the Examiner seems to be suggesting that due to spontaneous and unwanted diffusion *some* coating material may stick to the edges of the orifice and may be deposited around it. Applicants submit that this is an accidental feature which is in no way inherent in the method of Rhoades. To the extent that the Office Action may be relying on the doctrine of inherent disclosure, just because a certain result or characteristic may occur in the prior art does not establish the inherence of that result or characteristic. M.P.E.P. § 2112.

Moreover, in order for a claim to be rejected under 35 U.S.C. § 103(a), not only must the cited references teach or suggest each element of the claim, but the prior art

must also *suggest* combining the elements in the manner contemplated by the claim. M.P.E.P. § 2143.01. The prior art must also suggest the *desirability* of the claimed invention. M.P.E.P. § 2143.01. The mere fact that references *can* be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990).

From the summary given in Section 1 of this Response, it is apparent that the disclosure of Rhoades bears only a tenuous relationship to the presently claimed subject matter. Rhoades describes a method for electroplating the *internal shapes* of an orifice with a precisely controlled layer of material for purposes of controlling flow resistance. The problem of coating the *exterior* of the orifice is completely irrelevant as regards the object of the invention of Rhoades et al., since the exterior shape of an orifice has only a slight effect on the fluid flow rate. In fact, Rhoades only specifically mentions the use of a PTFE coating on the *interior* surface of the orifice to improve orifice lubrication, which is directly related to the flow rate. Nally et al. do not mention a coating at all. Accordingly, Applicants submit that there is no motivation in the prior art for combining the applied references. Therefore, a basic requirement for a rejection under 35 U.S.C. § 103(a) is missing.

In this respect, the coating of the exterior surface of a fuel injector is not taught or suggested by either Nally et al. or Rhoades, exactly *because* those references do not address any problem related to the exterior surface, e.g., the problem of soot deposit on a valve tip. “The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and *the nature of the problem to be solved as a whole* would have suggested to those of ordinary skill in the art.” *In re Kotzab*, 217 F.3d 1365, 1370, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000). (Emphasis added.) The problem to be solved by the method of Rhoades is the precise control of the flow resistance through an orifice, which bears essentially no relationship to the presently claimed subject matter.

Applicants further note that in order for a claim to be rejected under 35 U.S.C. § 103(a), a reasonable expectation of success is required. M.P.E.P. § 2143.02. Even assuming that a practitioner wished to provide the coating by the method described by Rhoades, the method *could not be used to coat the exterior surface of an orifice*. As mentioned above, the deposition of some material around the orifice is only an accidental feature of the method of Rhoades and cannot be controlled with any accuracy. It should be noted that in the method of Rhoades, the process is stopped when a desired flow resistance is reached (claim 1). It is not known how much, if any, material has been deposited outside the orifice at the time the process is stopped. It would take a great deal of experimentation to modify the method of Rhoades, which is intended to coat the interior surfaces of an orifice, to coat the exterior surfaces of the same in a desired manner.

On the basis of the foregoing discussion, Applicants respectfully traverse the combination of Nally et al. and Rhoades, which is based on improper hindsight reconstruction rather than on a suggestion from the prior art that is "clear and particular." *In re Dembiczak*, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999).

5. Other claim rejections

Applicants submit that on the basis of the remarks made in the preceding sections, Claim 16 has been shown to be allowable. Claims 17-25 depend on Claim 16, and therefore Applicants submit that Claims 17-25 are similarly allowable. Moreover, all the remarks made on pages 6 and 7 in the Amendment mailed on May 25, 2004 stand unchallenged, not having been specifically addressed by the Examiner in the Final Office Action mailed on September 10, 2004. Applicants submit that those remarks are still compelling, further supporting a request for withdrawal of the rejections, in particular, of Claims 17, 18 and 20-22, as well as their dependent claims 23 and 25.

Moreover, regarding Claim 18, the Examiner alleges: "It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the device of Nally et al. and Rhoades by providing coating comprising

PTFE as taught by Otomo et al. to resist heat and corrosion of the discharge orifice.” Applicants respectfully traverse the combination of Nally et al. and Rhoades with Otomo et al., which combination is not supported by the references or other prior art. In order for a claim to be rejected under 35 U.S.C. § 103(a), a reasonable expectation of success is required. M.P.E.P. § 2143.02. Otomo et al. describe a method to coat gaskets with a film of PTFE, using a curtain coating process. Clearly the method could not possibly be used, as described by Otomo et al., without completely sealing the fuel injection valve, thus obstructing the fuel inlet and the orifice. Applicants note that a gasket is a very simple and inexpensive article of manufacture, for which a simple and inexpensive method of fabrication is indicated, while a fuel injection valve is a sophisticated and expensive device for which the former method may not be expected to be suitable.

Regarding Claim 21, Applicants submit that the combination of Nally et al. and Rhoades does not teach or suggest that “the coating is provided in a ring shape around the at least one discharge orifice.” In order for a claim to be rejected under 35 U.S.C. § 103(a), a reasonable expectation of success is required. M.P.E.P. § 2143.02. As discussed above, the accidental deposit of material outside the orifice in the method of Rhoades is not controllable, and its shape will be substantially unpredictable, so “a ring shape” cannot be reasonably expected.

Regarding Claim 22, Applicants submit that neither Nally et al. nor Rhoades teaches or suggests that “the coating is provided over an entire surface of a downstream exterior surface of the component.” Clearly the coating method of Rhoades cannot be adapted to coat an entire exterior surface without undue experimentation.

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Reply to Office Action of September 10, 2004

CONCLUSION


In light of the foregoing, it is respectfully submitted that all pending claims are in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully Submitted,

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